

**Abstract for IPPW5 Session VII:  
Emerging, enabling, and extreme environment technologies; cross-cutting technologies**

**Real-Time 3D Collaborative Design Simulation in Support of NASA and ESA Planetary  
Exploration Programmes**

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NASA and ESA have a long history of investing in virtual teleoperations, CAD/CAM, aerodynamic visualization and other aspects of 3D modeling and work practice simulation.

Successful recent uses of virtual environments in mission training and operations include the Hubble Telescope repair mission in 1993 and the use of 3D tools such as RSVP and Viz in the current MER missions. To date, however, real-time 3D has been used only infrequently during the concept engineering phase of vehicle and mission design. NASA has instead relied largely on static artist's conceptions and more linear, textual descriptions in documents and teleconference calls. The situation at ESA is largely similar. A problem often observed with the existing modalities is that cognitively complex mission designs cannot easily be communicated and iterated.

DigitalSpace Corporation has been supported by NASA for the past six years to construct an open source, real-time 3D collaborative design engineering and training platform. That platform is now being used to support several projects at NASA and its contractors.

The paper will detail the architecture, successes and limitations of the Digital Spaces (DSS) open source collaborative real-time 3D simulation platform as a rapid prototyping design tool in a number of NASA programs. We believe that the modeling of entire architectures and missions for both in-space vehicles and surface operations is now practical for low to medium fidelity representations of mission trade spaces. Iteration of design concepts before committing greater resources to computer aided design models and physical prototypes may lower costs and provide better designs. Indeed, real-time 3D modeling and simulation may have a role in the full lifetime of a mission being used to ultimately produce tools for day-to-day mission operations.

An example of the planned use of DSS within the context of a prototype Mars exploration platform will be presented.

As this project is open source, we invite participation in the continued development of the platform by NASA, ESA, the academic and aerospace contractor communities.

**Keywords:** integrated 3D modeling and simulation, trade studies, agent-based work practice simulation, collaborative design simulation, modular training environments